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OFFICE NOTE 73

Verification of Winter Seasonal Temperature Forecasts for Southern New England Using the Rules Developed by Franz Baur

A. James Wagner
Extended Forecast Division
National Meteorological Center

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A test was made on the most recent 21 years' data to see whether the quasi-empirical rules developed by Dr. Franz Baur [1] for forecasting winter temperatures in southern New England were reliable. Baur's rules were formulated in slightly revised form in 1955, so most or possibly all of the years tested represent independent data. The years tested cover the warm 50's and the cold 60's, so a variety of secular regimes are included.

Results of the test are shown in tables 1 and 2, and are rather disappointing in view of the good results and reliability claimed by Baur, at least for the dependent data. If one had somehow recognized the secular regimes and forecast above normal every winter from 1951 to 1960 and below normal from 1961 to 1971, the forecast would have been correct 12 times and within one class 5 times and "dead wrong" only 4 times, as against a chance distribution of 7 in each category.

The verification of Baur's rules is a bit tricky since they are not written in terms of well-defined numerical categories. In fact, the rules only claim to distinguish warm winters from near normal or cold ones, without separating the cold and near normal categories. In those instances in which no rules were fulfilled, no forecast was considered to have been made. For verification purposes, "no forecast" was considered as a separate forecast category to see if it had any predictive value. On two

[1] Franz Baur, "Physicalische - Statistische Regeln als Grundlage für Wetter-und Witterungs-Vorhersagen," Akedemishe Verlags gesellsehaft in Frankfurt a. M. (Germany) Vol. 2, 1958.

occasions southern New England was observed to be partly near and partly above normal; this was introduced as a separate observed category.

The results of each year's forecasts are shown in Table 1, and the pertinent rules are listed in the Appendix. It should be noted that in 3 of the 4 years when Rule 67 failed in its indication of a warm winter in southern New England, the weather turned decidedly colder than normal in late November or early December. In the light of this relationship, the last sentence of Rule 67 might better be stated "This rule is likely to fail if the first half of December is colder than normal." For the purposes of any seasonal outlook for winter prepared before December or before a reliable outlook for the first half of December can be made, Rule 67 should be considered unreliable.

None of the rules appear to be especially reliable. Perhaps the best indication (from this limited sample of 21 years) is that when no rules are fulfilled, the winter temperature will most likely average near normal over southern New England.

Table 1 - Results of Applying Baur Rules for Forecasting Winter Temperatures in Southern New England

November	Rule Number - Remarks	Winter	Forecast	Observed
1951	69 fulfilled 69a almost	1951-2	N or B	A
1952	67 fulfilled	1952-3	A	A
1953	67 fulfilled	1953-4	A	A
1954	68 fulfilled 67 almost	1954-5	A	N-A
1955	66 and 69 fulfilled	1955-6	B or N	B-N
1956	No rules fulfilled	1956-7	No Fcst	N
1957	67 marginally fulfilled	1957-8	A	A-N
1958	67 fulfilled but cold early Dec.	1958-9	A	B
1959	69a marginally fulfilled	1959-60	N or B	A
1960	67 fulfilled	1960-1	A	B
1961	No rules fulfilled	1961-2	No Fcst	N
1962	69a marginally fulfilled	1962-3	N or B	B
1963	67 fulfilled but cold early Dec.	1963-4	A	B
1964	67 fulfilled but cold late Nov.	1964-5	A	B
1965	69 and 69a almost fulfilled	1965-6	No Fcst	N
1966	67 almost fulfilled	1966-7	No Fcst	N
1967	No rules fulfilled	1967-8	No Fcst	B
1968	69 marginally, 69a definitely ful.	1968-9	B or N	B-N
1969	69 almost fulfilled	1969-70	No Fcst	B
1970	No rules fulfilled	1970-1	No Fcst	B
1971	67 and 68 almost fulfilled	1971-2	No Fcst	A

Table 2 - Results of Baur Rules placed in form of a Contingency Table

Forecast \ Observed	Above	N-A	N or B
Above	2	2	0 | 4
No Forecast	1	0	4 | 3
N or B	2	0	0 | 3

APPENDIX

BAUR'S RULES FOR FORECASTING NEW ENGLAND WINTER

for A "Rule 65: When the mean temperature of the first half of December in Boston is more than 5.0°F above normal, one can reckon with high probability of success that the winter as a whole in southern New England in time and areal cross-section will be warmer than normal.

for B or N "Rule 66: If November in Winnipeg is more than 3.5°F too cold and if besides, the first half of December in Boston is too cold or at most 0.2°F too warm, one can reckon that it is highly probable that the winter as a whole in time and areal cross-section in southern New England will be colder than normal or at most 0.9°F warmer than normal.

for A "Rule 67: If November at at least 4 or the 5 stations Winnipeg, Chicago, Boston, St. Louis, and Cincinnati are at least 2.0°F warmer than normal or if, indeed, only 3 of these stations are at least 2.0°F too warm in November, among the three being Boston, while the other 2 [of the 5] show positive temperature departures, one can with about 85% probability reckon that the winter as a whole in southern New England will be warmer than normal. This probability is raised materially if the first half of December is warmer than normal.

for A "Rule 68: When in November the mean temperature at Winnipeg is not more than 5.0°F, and [those] in Chicago and Boston not more than 4.0°F below normal; when, further, the mean pressure 1/2 (Jacobshavn + Upernivik) is below normal, [and] when, finally, the departure of mean pressure in the last third of November at at least 2 of the stations Angmagssalik, Stykkisholm and Thorshavn and in the mean of these 3 stations is negative, one can reckon with very high probability of occurrence that the winter in time and areal cross-section in southern New England will be milder than normal.

for B or N "Rule 69: When the mean pressure difference Ponta Delgada - Stykkisholm in November is more than 3.0 mb below normal and the mean November pressure of 1/2 (Jacobshavn + Upernivik) is above [normal] and [that] of 1/2 (Washington + Charleston) on the contrary is below normal then follows in southern New England an on the whole too cold or at least a not appreciably mild winter with a mean temperature departure of more than + 1.0°F, provided that the November mean temperatures at 4 of the 5 places Winnipeg, Chicago, Boston, St. Louis, and Cincinnati are not at least 2°F above the normal or those at Boston and two others not at least 2°F above the normal and also the other 2 [of the 5] do not show a positive departure.

for B or N "Rule 69a: When in November the pressure difference Ponta Delgada - Stykkisholm is at least 1.0 mb less than normal and the mean pressure in Washington and the mean temperature in Boston are below normal, one can reckon with high probability [of success] that the mean temperature of the following winter in southern New England will be below normal or near normal (departure less than + 0.5°F).

Location of Stations

Ponta Delgada - 38°N 26°W
Upernivik - 73°N 56°W
Stykkisholm - 65°N 23°W
Angmagssalik - 65°N 37°W